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Authors

Gold, Alexandra

Rabideau, Dustin

Katz, Doug

et al.

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Self-Efficacy for Exercise in Adults with Lifetime Depression and Low Physical Activity

Alexandra K. Gold, PhD[a,b], **Dustin J. Rabideau, PhD**[b,d], **Doug Katz, PhD**[a,b], **Amy T. Peters, PhD**[a,b], **Jayati Bist, MA**[a], **Evan A. Albury, BS**[a], **Nevita George, BS**[a], **Ingrid R. Hsu, BA**[a], **Madelaine Faulkner, MPH**[c], **Mark J. Pletcher, MD, MPH**[c], **Andrew A. Nierenberg, MD**[a,b], **Louisa G. Sylvia, PhD**[a,b]

[a]Department of Psychiatry, Massachusetts General Hospital, Boston, MA, USA

[b]Harvard Medical School, Boston, MA, USA

[c]University of California, San Francisco, San Francisco, CA, USA

[d]Biostatistics, Massachusetts General Hospital, Boston, MA, USA

Abstract

People may be more likely to exercise if they have self-efficacy for exercise (SEE). We conducted an exploratory analysis of SEE using data from a clinical trial designed to increase physical activity (N = 340). We evaluated correlates of baseline SEE and the relationship between baseline SEE and physical activity. Low SEE at baseline was correlated with lower well-being, physical activity, and higher depression at baseline. Participants with high (vs. low) baseline SEE had higher physical activity (but no differential *change* in activity) over time. These data highlight the potential role of SEE in psychological health and physical activity.

Keywords

self-efficacy for exercise; depression; physical activity; exercise

Introduction

Self-efficacy, or confidence in one's capacity to achieve certain goals (Bandura, 1997; Warner and Schwarzer, 2020), motivates positive behavior change. Increases in self-efficacy are associated with improved psychological health, such as fewer depressive symptoms (Holahan and Holahan, 1987; Wang et al., 2022) and higher subjective well-being (Milam et al., 2019). High self-efficacy may facilitate individuals to engage in health behaviors such as higher exercise (Caetano et al., 2020; Sol et al., 2011). Moreover, low self-efficacy may be a perceived barrier for exercise engagement (Blom et al., 2021; Stutts, 2002).

Identifying facilitators and barriers for exercise engagement is important given the potential dual benefit for exercise to improve both psychological and cardiovascular health (Lavie et al., 2015; Sharma et al., 2006; Tabernero et al., 2021). For example, it was estimated in one study that up to 12% of new cases of depression could have been prevented through physical activity (Harvey et al., 2018) and exercise positively impacts multiple risk factors for cardiovascular disease (CVD) (Lavie et al., 2015; Tian and Meng, 2019). Given the

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potential of high self-efficacy to facilitate exercise and low self-efficacy to be a barrier for exercise, it is important to understand the factors that may contribute to one's self-efficacy for exercise (SEE), perhaps especially in individuals with a history of depression and low physical activity. In a series of exploratory analyses, we examined correlates of SEE in this population and investigated whether low versus high SEE at baseline predicted differential longitudinal exercise trajectories over the course of the study. We hypothesized that 1) at baseline, reduced physical activity and poorer psychological health (i.e., depression, stress, poor well-being) would correlate with reduced SEE. We also hypothesized that 2) higher self-efficacy at baseline would result in more improvement in exercise over the study period.

1. Methods

1.1. Study overview

This is an exploratory analysis of data from a comparative effectiveness study evaluating two, 8-week online behavioral interventions for increasing physical activity (i.e., # of daily steps measured with a wearable activity monitor). Participants were recruited from two online communities: one composed of individuals with mood disorders (Sylvia et al., 2018) and another composed of individuals with or at-risk for cardiovascular disease (Guo et al., 2017). Eligible participants were 18–65, had < 150 minutes of physical activity/week of any intensity (Craig et al., 2003; Lear et al., 2017; Piercy et al., 2018), and a lifetime major depressive episode assessed via a self-report version of the MINI International Neuropsychiatric Interview (Sheehan et al., 1998). All participants provided electronic informed consent. Refer to (Sylvia et al., 2021) and (Sylvia et al., 2023) for further details on the study design.

1.2. Assessments

Demographics.—At screening, we collected demographic information on age, sex (male or female), and education status (coded as "some college or less" or "college or greater").

Self-reported Mood, Exercise and Functioning.—We assessed self-reported physical activity (IPAQ – Short Version) (Craig et al., 2003), functional capacity (e.g., ability to engage in activities associated with varying levels of physical exertion; Duke Activity Status Index [DASI] (Alonso et al., 1997), well-being (WHO-5 Well-Being Index) (Topp et al., 2015), perceived stress (Perceived Stress Scale [PSS]) (Cohen et al., 1983), depressive symptom severity (Patient Health Questionnaire-9 [PHQ-9]) (Kroenke et al., 2001), and (hypo)manic symptom severity (Altman Self-Rating Mania Scale [ASRM]) (Altman et al., 1997). Self-reported physical activity via the IPAQ was calculated as the total physical activity (MET-min/week) score, which was computed as the sum of Walking + Moderate + Vigorous MET-min/week (Craig et al., 2003; IPAQ Research Committee, 2005).

Self-efficacy for Exercise (SEE) (Resnick and Jenkins, 2000).—The SEE is a 9-item measure inquiring as to the respondent's confidence that they could exercise 3 times weekly for 20 minutes across varying scenarios (e.g., "The weather was bothering you," "You did not enjoy it"). Each item is scored on a scale from "0" (not confident) to "10" (very confident), with total scores ranging from 0 to 90.

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1.3. Data analysis

To our knowledge, there is no widely-accepted or validated cut-off score for high versus low SEE; thus, we chose to dichotomize SEE to allow for analysis and interpretation of results (i.e., treating SEE as a continuous variable would require making assumptions about the functional relationship between SEE at baseline and physical activity over time). To explore baseline correlates of SEE, we dichotomized baseline SEE using the median score in this study (i.e., SEE score ≤ 41 was low self-efficacy, > 41 was high self-efficacy) and tabulated demographics, mood, and exercise variables at baseline overall and by low vs. high SEE subgroup; comparisons between subgroups were made using Fisher's exact tests or unequal variance t-tests, as appropriate. We also calculated Pearson correlation coefficients between baseline SEE score and each continuous/ordinal variable as an additional way of characterizing these baseline relationships. We then fit linear mixed effects regression models with random participant intercepts and slopes to investigate whether low vs. high SEE at baseline predicted differential longitudinal exercise trajectories over the 16-week study period, measured using daily steps recorded via a Fitbit.

2. Results

Table 1 presents demographic and clinical characteristics (overall and by low vs. high baseline SEE) of the 340 participants who consented and were randomized in this study. Compared to participants with high baseline SEE, we found that a greater proportion of participants with low baseline SEE were female (versus male), had lower physical activity, lower well-being, and higher depression ($ps < .05$). Considering baseline correlations with numerical SEE score, we similarly found that reporting more physical activity (IPAQ: $r(284) = .142$, $p = .016$), more well-being (WHO-5: $r(336) = .204$, $p < .001$), and less depressive symptoms (PHQ-9: $r(338) = -.165$, $p = .002$) were each correlated with higher SEE at baseline, but age, education level, functional capacity, (hypo)mania symptoms, and perceived stress were not ($-.087 < r < .076$ and all $p > .10$).

Participants who did not provide any Fitbit data (26/340) did not contribute to subsequent longitudinal analyses. We found that although the average slopes (i.e., *change* in activity over the study) did not differ between low and high SEE subgroups (baseline self-efficacy by time interaction, $t=-.94$, $df=25331$, $p = .345$), high baseline self-efficacy was associated with generally higher levels of exercise across the study period (e.g., mean increase of 642 [95% CI: 142 to 1142] daily steps, $t=2.53$, $df=312$, $p = .012$, after removing the baseline self-efficacy by time interaction). A descriptive longitudinal trajectory plot of exercise across the study period (or steps per day over time) is presented in Supplementary Figure 1. An additional plot which presents four subgroups based on quantiles of SEE is presented in Supplementary Figure 2 to provide additional descriptive context for the longitudinal results.

3. Discussion

In this exploratory analysis, we had two primary aims. As a first aim, we evaluated baseline correlates of SEE among study participants. Consistent with our initial hypothesis, we found that lower physical activity, lower well-being, and higher depression were associated with lower SEE at baseline. In dichotomizing baseline SEE between those with high (i.e., greater than or equal to the median SEE value for the sample) versus low SEE, in addition to the previously described findings, we also found that a greater proportion of females had low SEE compared to males. As a secondary aim, we evaluated whether baseline SEE impacted physical activity over the study period. We found that higher SEE at baseline was associated with higher physical activity over the study period. We also found that the change, or improvement, in physical activity levels over the study period did not differ between those with high SEE and those with low SEE.

Our findings on lower psychological wellness (e.g., lower well-being, higher depression) and lower physical activity being associated with lower SEE are consistent with prior literature suggesting that greater self-efficacy is linked to improved psychological health (Holahan and Holahan, 1987; Milam et al., 2019; Miller et al., 2019) and reduced barriers for engaging with physical activity (Blom et al., 2021; Miller et al., 2019; Stutts, 2002). Our finding that women were more likely to have low SEE compared to men may be consistent with prior work which has found that women tend to be less physically active than men as well as have reduced self-efficacy (Edwards and Sackett, 2016; Pauline, 2013). This reduced self-efficacy may be due to women having fewer opportunities to engage in physical activity as well as men being more motivated to exercise due to internal factors (e.g., enjoyment, strength (Edwards and Sackett, 2016; Egli et al., 2011; Rothman, 2000). By contrast, women are more motivated to exercise for external factors (e.g., weight management) (Egli et al., 2011; Othman et al., 2022) which could explain why women tend to have fewer "mastery" experiences with exercise that might motivate engagement with physical activity (Edwards and Sackett, 2016). Prior research has also explored SEE among women reporting symptoms of depression. In one study, higher depressive symptoms were associated with a larger number of perceived barriers to exercise, and a larger number of perceived barriers to exercise was associated with lower SEE (Craft et al., 2008). This relationship has been replicated in other work, with another study finding that women who reported more depressive symptoms had lower SEE (Clum et al., 2014). Given the potential for exercise to decrease symptoms of depression (Harvey et al., 2018), clinical interventions that focus on increasing SEE may improve engagement with exercise and, in turn, symptoms of depression. Such an intervention may be especially useful for women with depression given that women may be uniquely impacted by low SEE.

It is noteworthy that those who did have high SEE at baseline had higher levels of physical activity over the course of the study. This result may reflect that SEE is an important criterion in predicting physical activity levels over time in individuals with a history of depression and low physical activity. Future physical activity-promoting interventions may want to focus on increasing SEE, rather than focusing on increasing physical activity in isolation.

This study is associated with several important limitations. First, participant drop-out over the course of the study and intermittent/non-use of participant Fitbits may affect our interpretation of study findings, such as change in physical activity levels over time. Second, data on mood symptoms were not collected on the same day (e.g., sometimes a few weeks apart) and some data (i.e., demographics, DASI) was assessed at a screening visit, or one month or more before the baseline session. Further, this study is limited by a homogeneous sample (i.e., across sex, race, ethnicity).

Despite these limitations, this exploratory study highlights SEE as a relevant variable in psychological wellness and levels of physical activity for those with a history of depression and low physical activity. It is possible that SEE could be a potential target mechanism for enhancing psychological health and physical activity in this population, warranting further exploration in future intervention research.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Self-efficacy represents the belief in one's ability to achieve certain goals.
- High self-efficacy may facilitate engagement in health behaviors, such as exercise.
- We evaluated self-efficacy for exercise in a physical activity trial.
- Participants had a depression history and low physical activity.
- Higher baseline self-efficacy was associated with more exercise over the study.

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Table 1.

Demographic and clinical characteristics of study participants by self-efficacy (SEE) for exercise at baseline.

	Overall N=340	**Low SEE N=171 (50.3%)**	**High SEE N=169 (49.7%)**	**P-value**
Age, mean (SD)	43.8 (11.3)	42.9 (11.5)	44.7 (11.0)	0.161
Female sex, n (%)	279 (82.1%)	150 (87.7%)	129 (76.3%)	0.007
Race n (%)				0.212
Black	23 (6.8%)	12 (7.0%)	11 (6.5%)	
Multiple race	9 (2.6%)	6 (3.5%)	3 (1.8%)	
White	281 (82.6%)	135 (78.9%)	146 (86.4%)	
Other	27 (7.9%)	18 (10.5%)	9 (5.3%)	
Hispanic n (%)	26 (7.7%)	16 (9.4%)	10 (5.9%)	0.308
College or higher education n (%)	197 (58.3%)	102 (60.0%)	95 (56.5%)	0.581
IPAQ, mean (SD)	950.81 (1890.47)	718.63 (1357.61)	1196.36 (2304.94)	0.035
DASI, mean (SD)	47.7 (11.6)	47.5 (11.8)	48.0 (11.5)	0.694
WHO-5, mean (SD)	31.5 (19.8)	29.1 (20.2)	34.0 (19.0)	0.021
PSS, mean (SD)	21.7 (7.1)	22.1 (7.1)	21.2 (7.0)	0.245
PHQ-9, mean (SD)	10.45 (5.7)	11.2 (5.8)	9.67 (5.39)	0.011
ASRM, mean (SD)	2.0 (2.6)	1.9 (2.7)	2.12 (2.49)	0.411

IPAQ: International Physical Activity Questionnaire; DASI: Duke Activity Status Index; SEE: Self-Efficacy for Exercise; WHO-5: WHO-5 Well-Being Index; PSS: Perceived Stress Scale; PHQ-9: Patient Health Questionnaire – 9; ASRM: Altman Self-Rating Scale for Mania. P-value was based on Fisher's exact test (for categorical variables) or unequal variance t-test (for continuous variables).